THE PROJECT OF THE TELEMEDICINE SYSTEM FOR A FAMILY DOCTORS' PRACTICES

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Abstract-**The paper deals with a concept of a telemedicine system for the family doctor practices (FDP). The project offers the potential to improve: access to high-quality primary health care, education of family doctors and patients, This is a project which is realised in collaboration of two scientific partners: Department of Medical Informatics from Wroc³aw University of Technology Department of Family Medicine from Wroc³aw Medical University. For a start the telemedicine system will be prepared for the Lower - Silesian territory in Poland.**

Keywords **-Telemedicine, medical informatics, telecomunication**

I. INTRODUCTION

On the base of the CEC/AIM Telemedicine Working Group, we can refer the telemedicine definition as, a the investigating, monitoring and management of patients and the education of patients and staff, using systems which allow ready access to expert advise and patient information no matter where the patients or relevant information is located.

Differently speaking – telemedicine [1,2,3] has the potential to make a difference in the lives of any people. In rural areas, where a patient and the health professional can be hundreds of kilometres apart, telemedicine means access to health care. In emergency cases, this access can mean the choice between live and death.

"Telemedicine also has potential to improve the delivery of health care in the world by bringing a wider range of services such as radiology, mental health services and dermatology to undeserved communities and individuals in both urban and rural areas. In addition, telemedicine can help attract and retain health professionals in rural areas by providing ongoing training and collaboration with other health professionals" – (from telemedicine report to the US Congress). Current telemedicine practice incorporates the use of medical image transfers and videoconferencing for consultation, multidisciplinary and specialist support, continuing education, and administration.

The first telemedicine experiences date back to the beginning of the 1960's in the USA. Their aim was the monitoring of the astronaut's heart and cardiovascular system. Leter, other applications of telemedicine, such as:

- ECG transmissions between Logan Airport (Boston) and the Massachusetts State Hospital,
- ECG transmission to Norfolk,
- transmission of images (black and white) regarding the gynaecological field.

The regional-wide relevance of Department of Family Medicine, has driven many thousands of patients coming from all over Low – Silesian and asking for health care services not available at their own cities. In October 1993 according to the decision of the Polish Ministry of Health, was created new medical specialisation for health care system in Poland – the family doctor practices (FDP). Essence of this decision was education of the family doctors, which will be possessing very wide competencies and will be occupying frontal place in the health care system in Poland. The basic family doctor's task should be assurance of the fundamental and continuos health service. Family doctor's health services must be dedicated for individual persons, families and for local community, independently of age, sex and kind of diseases. Family doctor must take care of patients from the moment of birth to the death. The basic institution in such model of health care system is family doctor practice. It means, universal activity of family doctor, which is a resultant of many activities. Family doctor care for ill people in his practice, in a patient's home, sometimes in a hospital or clinic. He is so - called first contact's doctor and health of patients depends on, his knowledge, correct diagnosis and treatment. Family doctor, as first, takes the decisions and activities for the life saving and for the care of patient's health. Range of the family doctor's competencies, in comparison with medical services that were given in the past health care system by so – called GP, undergoes enlargement. Family doctor will make the little surgical intervention, apply first -aid and consultations and he will examine of patients within the domain of internal, laryngology, gynaecology, children diseases and many other specialisation. He will care for the expectant mother and secure continuity of therapy for patients with chronic diseases. Family doctor must participate in patient's rehabilitation after surgical intervention or infract. He should take into account, influence of the natural environment, conditions of life and work, on the health of patients. We must remember that, the main goal of the family doctor's work is accumulation as much as possible information about patients and their environment. In his work, the family doctor must collaborate with the different parts of national health care system. This fact connects with problems of the information's, material's transmission and with the administration decision preparation.

As we can see, the family doctor has many duties and responsibility for a quality of his work. According to the description of family doctor practices we notice that there are two unfavourable phenomena:

- necessity of on - line medical consultation for difficult cases of diseases,

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- non - comfortable access to the medical services for patients with chronic diseases (in case if we have a long distance between doctor and patient).

We can say that, the telemedicine system for FDP is reasonable and its application should create the following practical impressions:

- change for a better, the access to the family doctor services by facilitation of a contact with patients, wherever patients are,
- make possible for the family doctor to obtain easy possibilities of learning, consulting, wherever the information centre or consultants are,
- facilitation of the administrative, orgazinational and logistic works by improvement of the information exchange with different parts of the heath care system.

II. DESCRIPTION OF TELEMEDICINE SYSTEM FOR FDP

Taking into account the actual, orgazinational state of a family medicine system on the Lower - Silesian territory and its structure, we propose the telemedicine services which are bounded to the three arrangements:

1.patient - FDP,

2.FDP-information and consultation centre, which consist of the Department of Family Medicine and the Regional Centre of Education for Family Doctors,

3.net of the connections between separate family doctor practices.

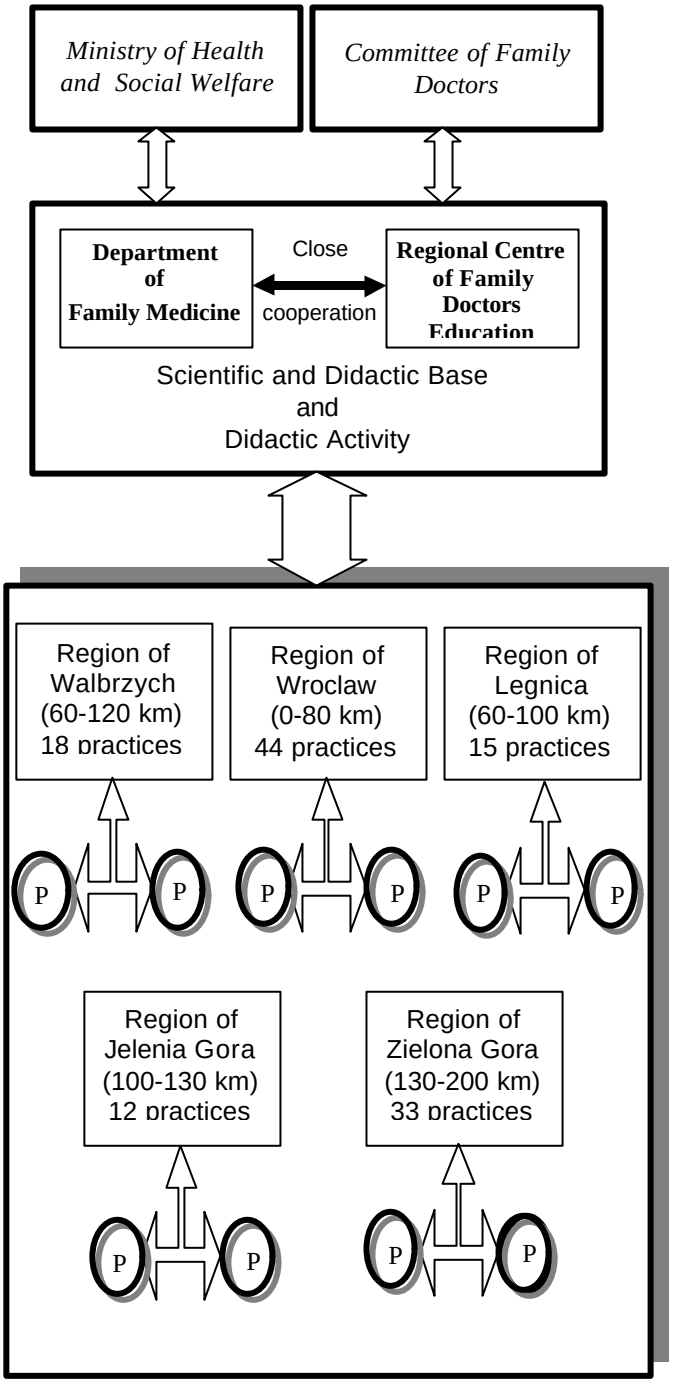
Additional fact, which gives the reason for creation this kind of connections, is existing (from five years) the orgazinational system of the family medicine on the Lower-Silesian (Fig.1).

This system contains former provinces: Jeleniogorskie, Legnickie, Walbrzyskie, Wroclawskie i Zielonogorskie, that means present Lower– Silesian province and half of Lubuskie province. Main part in the system is the Department of Family Medicine and the Regional Centre of Education for Family Doctors. Both institutions create the scientific and didactic base for the family doctors, organize and co-ordinate an education and help in formation of new practices. They take the important role as an information and consultation centre in the telemedicine system. Each task which is connected with a realization of this telemedicine system we can specify as below:

a) Analysis of usefulness for different transmission systems, elaboration for a model of data and algorithms of data distribution, determination the net structure{4,5], solution the data and signals coding problem and finally, solution the problem of the file compression without loss,

b) Construction of the algorithms for spectral and time analysis HRV (*Heart Rate Variability)*, ECG signals' parameters detection algorithms, algorithms for determination a morphometrical features of graphic objects with possibility of learning,

c) Construction of the teleconsultation system with WYSIWYS (*What You See Is What I See)* interface for common works with multimedia document, project of the



P – family doctor practices

Fig. 1. Structural scheme of FDP system in the Lower-Silesian region

hipertekst and rule base for expert system, project of the WWW service for FDP,
d) Logical project of telemedicine system for the Lower – Silesian region and its application,
e) Investigation the influence of the telemedicine system on the cost's reduction in FDP.

From functional point of view, services of telemedicine system in configuration "family doctor – patient" mean:

- Remote diagnosis,
- Remote patient registration,
- Remote registration, monitoring and transmission EKG signals and another biomedical signals,
- Remote measurement of blood pressure and pulse, body temperature and another physiological parameters,

as we can see below (Fig.2).

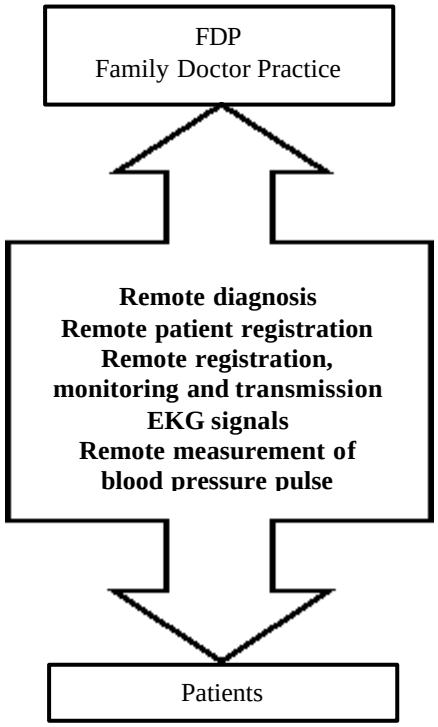


Fig. 2. The telemedicine system's services for comfiguration FDP - Patients

On the other hand, telemedicine system should be able to remote consulting and education by voice and picture. It may be made as a teleconference with utilisation the multimedia documents. Teleconference in the system means interactive electronic communication between two or more specialists at two or more sities, which make use of audio equipment, audiograpfic computers, video systems and high grad dedicated lines that allow for voice, data, and (or) video transmission.

As a communication tool, system will use the computer nets (INTERNET,POLPAK) and (or) the telecommunication nets (GSM,ISDN).Very important is a choice of adequate protocols for a various transmitting data.

One of the most important part of this system is teleconsulting module, whose allow the physician the non-stop access to medical data on the remote server or to the experts in the medical centre. The requirements for the specialized databases project are as follow:

- The database system has to guarantee easy access and update from the different site in the Internet (on site and remote),
- It is necessary to run system in the WAN environment[7],
- It is necessary to allow off-line access to database e.g. using the GSM services "mail via SMS" and "SMS via mail",
- The architecture of the systems can allow formulated question not only to database, but to the real experts in the telemedicine center.

We propose to construct tree kind of the Internet services.

a) *"How to do" database*

In this project there is necessary getting the expert knowledge for the various medical specializations and systematizing it in the easy accessible form, i.e. in the form of the "step-by-step" algorithms for the different medical cases (e.g. how to protect the amputated limb after accident for the future sewing it).

b*) Case database*

This database will consist of the selected (by experts) medical cases included disease, symptoms and therapy. This database can be use by students of medicine or by the physician to improve their qualification ("learning on cases"). In the future we plan to use this knowledge to develop decision support systems.

c) *Drugs database*

The main idea of this project is to systematize information about drug accessible in the Polish market (contraindication, dose, replacement drugs, pharmacological groups and therapeutic advice), work out mechanism of automatic update of database.

Those requirements cause that we decide to implement those teleconsulting systems as the WWW services.

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